



statistical instruments for industry



T E N T A T I V E D A T A

M O D E L 6 1 0 A

A L L S O L I D S T A T E

1 0 C P S T O 5 M C N O I S E G E N E R A T O R

The increasingly complex fields of telemetry, multiplex communications, environmental testing, and related areas, often require an accurate source of gaussian (normal) distributed noise in some frequency range between 10 cps and 5 mc. The all solid state model 610A was specifically designed to meet this requirement in addition to being an excellent general purpose instrument.

The Model 610A Noise Generator employs a solid state device as a noise source. The output of the noise source is amplified by a special low noise feedback preamplifier. The noise is then passed through one pole of the maximally flat switchable filter. The resulting signal is then amplified by a feedback amplifier, passed through the variable attenuator, and then further amplified by a variable gain feedback amplifier. The appropriate gain for each frequency range is selected by the range switch. The resulting noise voltage is then passed through two active poles of the maximally flat switchable filter to the output amplifier. The output of this amplifier is fed to the output meter and the five position output attenuator. The output of the attenuator is brought to the front panel. The output meter is a transistor voltmeter calibrated to read the RMS value of a gaussian distributed voltage. The required dc power is supplied by a regulated power supply that uses a zener reference diode.

E L G E N C O I N C O R P O R A T E D
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SPECIFICATIONS

FREQUENCY RANGES

Eight ranges selectably by front panel switch; 10 cps to 2 kc, 10 cps to 5 kc, 10 cps to 20 kc, 10 cps to 50 kc, 10 cps to 200 kc, 10 cps to 500 kc, 10 cps to 2 mc, and 10 cps to 5 mc.

OUTPUT SPECTRUM

Uniform to ± 0.5 db from 10 cps to 500 kc and ± 2.0 db from 500 kc to 5 mc.

OUTPUT LEVEL

0 to 1 volt RMS, adjustable by front panel amplitude control. A dynamic range of 5 to 1 peak to RMS value is provided.

OUTPUT STEP ATTENUATOR

Five positions; X1.0, X0.1, X.01, X.001, X.0001

Accuracy ± 0.025 db per step to 500 kc; ± 0.063 db per step to 5 mc.

SPECTRAL DENSITY

Approximate spectral density for 1 volt RMS output

Band	volts/ $\sqrt{\text{cps}}$	Band	volts/ $\sqrt{\text{cps}}$
2 kc	1.75×10^{-2}	200 kc	1.75×10^{-3}
5 kc	1.1×10^{-2}	500 kc	1.1×10^{-3}
20 kc	5.5×10^{-3}	2 mc	5.5×10^{-4}
50 kc	3.5×10^{-3}	5 mc	3×10^{-4}

AMPLITUDE PROBABILITY DISTRIBUTION

Symmetrical Gaussian Distribution all ranges.

OUTPUT METER

Meter reads 0 to 1 volt RMS

Accuracy $\pm 2\%$ of full scale to 2 mc; $\pm 5\%$ to 5 mc

MAXIMUM LOAD

500 ohms on direct output

OUTPUT IMPEDANCE

Approximately 50 ohms direct output.

Step attenuated output 50 ohms $\pm 5\%$

POWER SUPPLY

Built-in highly regulated dc supply.

POWER REQUIREMENTS

115/230 volts $\pm 10/20$ volts, 50 to 1,000 cycles ac; approximately 7 watts. A rechargeable power option is available. Battery is recharged by operating unit on ac line.

PANEL COLOR

Panel is clear anodized brushed aluminum.

DIMENSIONS

5-1/4" high x 8-5/8" wide x 11" deep.

RACK MOUNT

A rack mounting adapter kit is available for rack mounting two units side by side. Also available is a rack mounting adapter kit for rack mounting one unit. One or two units use 5-1/4" x 19" of rack panel space with adapter kit. Full rack width cabinet option for one unit is available. Size of unit with this option is 5-1/4" high x 17" wide x 11" deep and comes with rack mounting hardware.

SHIPPING WEIGHT

Approximately 11 lbs.



ELG ENCO INCORPORATED
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MODEL 311A

GAUSSIAN NOISE GENERATOR

In the analysis and synthesis of complex guidance, control and communication systems it is often necessary to determine the effects of noise signals on system performance. The complexity of modern systems and the nature of their stringent performance requirements necessitate that more and more consideration be given to system operation in response to statistical inputs.

Many performance inaccuracies are essentially random functions of time and they cannot be prescribed a priori except in a general statistical sense. For example, the position of a target indicated by a radar set contains components of noise which vary with time in an unpredictable way; also, as a result of manufacturing tolerances in a system, the sensitivities and other fixed parameters of operating components are subject to variations, either in the form of slight fluctuations with time or in the form of variations from one system to another; also, an automatic control system is seldom designed to perform a single task which may be completely specified beforehand but it is designed to perform a task selected at random from a complete repertory of possible tasks. In general, every phenomena which is not amenable to exact a priori specification becomes the proper subject for study by the methods of statistical reasoning.

The Model 311A Noise Generator was designed to fill the need for a precise general purpose instrument which can accurately simulate various random quantities under study. It supplies two gaussian noise voltages with precisely controlled "white" power frequency spectra; one output has a spectral characteristic covering the range from 10 to 20,000 cps (or higher) and the other output covers the range from 0 to 40 cps. These characteristics make the Model 311A especially useful when used in conjunction with analog computers with a repetitive or iterative mode.

The basic noise source of the Model 311A is a gas tube in a transverse magnetic field. The magnetic field eliminates plasma oscillations which are generated by a gas discharge and thereby helps to insure the randomness of the amplitude distribution and the uniformity of the power spectrum. The output from the gas tube is fed into a shaping amplifier which equalizes the noise tube characteristics. The noise is then passed through a precision regulator circuit which continuously stabilizes its output against a zener reference voltage. The resulting noise voltage is passed through an attenuator and amplifier whose output has a constant noise spectrum from 10 to 20,000 cps.

The output from the regulator is also filtered by a precision network resulting in a band of noise centered about a frequency f_0 . After amplification by a variable gain feedback amplifier, the noise is phase-detected by a solid state chopper operating at f_0 cps. A low-pass filter removes the high frequency components arising from the detection process. The result is a low frequency noise voltage whose spectral density is constant from 0 to 40 cps.

SPECIFICATIONS

LOW FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION:

Gaussian (Normal) to plus or minus one percent.

OUTPUT SPECTRUM:

Uniform (constant) to plus or minus 0.1 db from 0 to 35 cps. Output falls off rapidly above 40 cps.

MAXIMUM OUTPUT LEVEL:

12 volts RMS into a 1 megohm input resistance. A dynamic range of 5 to 1 peak-to-RMS value is provided.

MAXIMUM SPECTRAL DENSITY:

Approximately 2.5 (volts)^2 per cps.

D. C. UNBALANCE:

Less than 50 millivolts, with 95% certainty.

HIGH FREQUENCY OUTPUT

AMPLITUDE PROBABILITY DISTRIBUTION:

Gaussian (Normal) to plus or minus two percent with zero mean.

OUTPUT SPECTRUM:

Uniform to plus or minus 0.5 db from 10 to 20,000 cps (can also be supplied with uniformity up to 50,000 cps).

MAXIMUM OUTPUT LEVEL:

15 volts RMS.

MAXIMUM SPECTRAL DENSITY:

Approximately $7.5 \times 10^{-3} \text{ (volts)}^2$ per cps.

OUTPUT LOAD:

Minimum 100,000 ohms.

POWER SUPPLY

Built-in highly regulated plate and filament voltage supplies.

POWER REQUIREMENTS

115v plus or minus 10v, 50/60 cycles AC at 90 watts.

COLOR

Rack panel is flat grey.

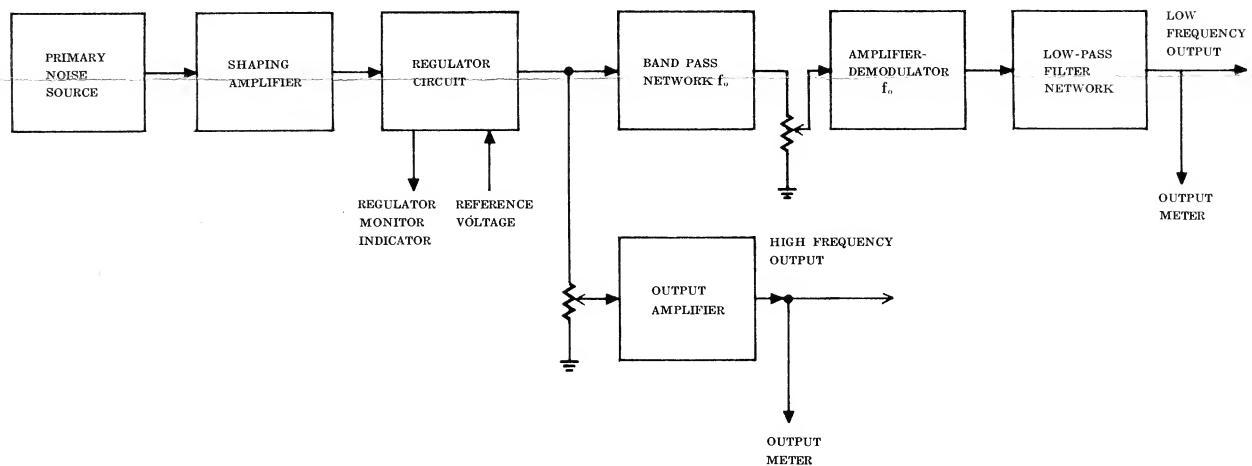
MOUNTING

Mounted on standard relay rack panel 7" high x 19" wide; Model 311A is 15" deep. Can be supplied in deluxe cabinet.

SHIPPING WEIGHT

Approximately 45 lbs.

BLOCK DIAGRAM OF MODEL 311A GAUSSIAN NOISE GENERATOR



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